

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	523	438/308,378,795.ccls. and @ad<"20000317"	US-PGPUB; USPAT	OR	ON	2005/08/16 15:33
L6	544	219/443,450,409,411,413.ccls. and @ad<"20000317"	US-PGPUB; USPAT	OR	ON	2005/08/16 15:37
L7	536	6 not 5	US-PGPUB; USPAT	OR	ON	2005/08/16 15:33
L8	12	(temperature and (wafer or substate) and gas and control\$4 and selectively and directly).clm.	US-PGPUB; USPAT	OR	ON	2005/08/16 15:37
L9	54	(temperature and (wafer or substate) and gas and control\$4 and selectively and direct\$3).clm.	US-PGPUB; USPAT	OR	ON	2005/08/16 15:42
L10	42	9 not 8	US-PGPUB; USPAT	OR	ON	2005/08/16 15:37
L11	21	10 and @ad<"20000317"	US-PGPUB; USPAT	OR	ON	2005/08/16 15:43
L12	8	(temperature and (wafer or substate) and gas and control\$4 and selective and direct\$3).clm.	US-PGPUB; USPAT	OR	ON	2005/08/16 15:42
L13	4	12 and @ad<"20000317"	US-PGPUB; USPAT	OR	ON	2005/08/16 15:43

US-PAT-NO: 5654904

DOCUMENT-IDENTIFIER: US 5654904 A

TITLE: Control and 3-dimensional simulation model of  
temperature variations in a rapid thermal processing  
machine

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Claims Text - CLTX (1):

1. A rapid thermal process for presetting and controlling a heating system used to heat a semiconductor wafer, the process comprising:

Claims Text - CLTX (2):

a) initializing input data to a computer main program, the input data including indicia relating to the heating system and properties of the semiconductor wafer;

Claims Text - CLTX (3):

b) calculating an expected temperature for a plurality of three-dimensional wafer volume elements versus time, responsive to the input data indicia;

Claims Text - CLTX (4):

c) individually controlling a power level to multiple heating elements within the heating system, the power level being controlled, directly or indirectly, by the computer main program responsive to the expected temperature calculated for the volume elements to provide a predetermined temperature ramp rate and steady state level for minimal wafer temperature nonuniformity;

Claims Text - CLTX (5):

d) monitoring the wafer temperature with at least one temperature sensor; and,

Claims Text - CLTX (6):

e) providing a temperature feedback from the temperature sensor to, selectively, a heat controller or the computer main program, thereby providing for quick and accurate controlling of the wafer temperature.

Claims Text - CLTX (7):

2. The process as recited in claim 1 wherein the semiconductor wafer has a diameter of between about 6 inches to about 12 inches.

Claims Text - CLTX (8):

3. The process as recited in claim 1 wherein the semiconductor wafer has a pattern which is irregular.

Claims Text - CLTX (10):

a) initializing secondary input data to the computer main program, the secondary input data including indicia relating to the heating system and properties of at least a second semiconductor wafer;

Claims Text - CLTX (11):

b) monitoring the at least second wafer temperature of the at least second wafer with at least one temperature sensor; and,

Claims Text - CLTX (12):

c) providing a temperature feedback from the temperature sensor to, selectively, the heat controller or the computer main program, thereby providing for quick and accurate controlling of the at least second wafer temperature.

Claims Text - CLTX (14):

6. The process as recited in claim 1 wherein the computer main program includes, selectively, fuzzy logic, a neural network, or a combination of fuzzy logic and a neural network.

Claims Text - CLTX (15):

7. The process as recited in claim 1 further including providing a gas around the semiconductor wafer while heating the semiconductor wafer.

Claims Text - CLTX (16):

8. The process as recited in claim 7 further including controlling a gas pressure while heating the semiconductor wafer.

Claims Text - CLTX (17):

9. A computer control system for presetting and controlling a heating system to heat a semiconductor wafer, the system comprising:

Claims Text - CLTX (18):

a) a main computer and computer program having input data, the input data including indicia relating to the heating system and properties of the

semiconductor wafer;

Claims Text - CLTX (19):

b) means for calculating an expected temperature for a plurality of three-dimensional wafer volume elements versus time, responsive to the input data indicia;

Claims Text - CLTX (20):

c) a heat controller having an input signal from, selectively, a temperature indicator or the main computer;

Claims Text - CLTX (21):

d) the heating system having a power input from the heat controller;

Claims Text - CLTX (22):

e) at least one temperature sensor; and,

Claims Text - CLTX (23):

f) a temperature feedback means for feeding back temperature data from the at least one temperature sensor to, selectively, the heat controller or main computer, wherein the main computer outputs time, temperature, wafer X and Y coordinates for the volume elements, and heat intensity to preset and control the heating system power input.

Claims Text - CLTX (24):

10. The system as recited in claim 9 wherein the semiconductor wafer has a diameter of between about 6 inches to about 12 inches.

Claims Text - CLTX (25):

11. The system as recited in claim 9 wherein the semiconductor wafer has a pattern which is irregular.

Claims Text - CLTX (26):

12. The system as recited in claim 9 further including the main computer and computer program having secondary input data, the secondary input data including indicia relating to the heating system and properties of at least a second semiconductor wafer.

Claims Text - CLTX (28):

14. The system as recited in claim 9 wherein the computer main program comprises, selectively, fuzzy logic, a neural network, or a combination of fuzzy logic and a neural network.

Claims Text - CLTX (29):

15. The system as recited in claim 9 further including means for providing a gas around the semiconductor wafer while heating the semiconductor wafer.

Claims Text - CLTX (30):

16. The system as recited in claim 15 further including means for controlling a gas pressure while heating the semiconductor wafer.